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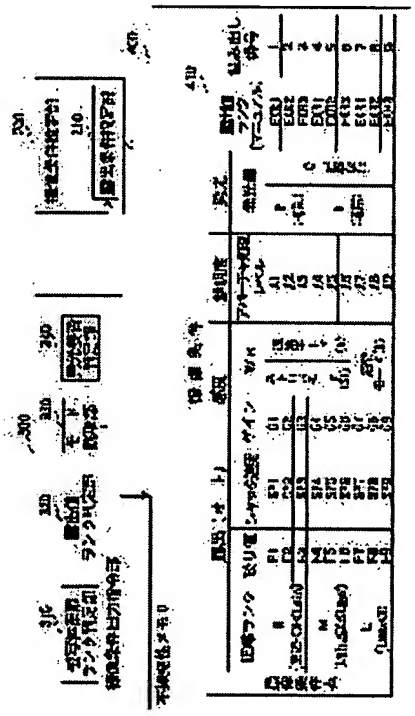
## (54) IMAGE PICKUP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image pickup device for picking up a suitable image, regardless of the position of an object.

SOLUTION: Corresponding to the range rank of the object (from a deciding part 310), a read mode (from a reading part 330) and an exposure value rank set by a user, as needed (from a deciding part 320), an output command part 300 determines a read number and selects one set of image pickup conditions from among an image pickup condition table 410. In the quantity of light to be emitted, the need for light emission (from a deciding part 340) is considered additionally. The image pickup conditions are set so that an (auto-) exposure value, a gain and the light emission quantity can be increased, corresponding to the enlargement of the distance rank and an aperture (contour emphasis) processing level can be lowered corresponding to the increase of the gain. Therefore, the lightness of the image becomes suitable, and noise is suppressed as well independently of the excess or deficiency of stroboscopic light caused by a distance. White balance control is made by an ordinary mode in the case of distance rank L and is suitably performed, corresponding to the color temperature of a light source.



## FULL CONTENTS

[Claim(s)]

[Claim 1] The distance sensor which grasps the distance to a photographic subject, and the luminous body which reinforces the catoptric light from said photographic subject by luminescence, The image receiving body which accumulates said catoptric light as picture information, and the exposure control part which controls the exposure to said image receiving body, It is the imaging device which it is an imaging device equipped with the sensitivity controller which adjusts the sensitivity to said catoptric light, and the control part which controls said exposure control part and said sensitivity controller, and said control part has embraced said distance, and controls based on the image pick-up conditions about the lightness of said picture information.

[Claim 2] Said control part is an imaging device according to claim 1 which has the distance judging part which outputs the contrast result obtained by contrasting said distance with a distance criterion, and the image pick-up condition setting part to which said image pick-up conditions according to said contrast result are set.

[Claim 3] As for said image pick-up conditions, said sensitivity is imaging devices according to claim 2 fluctuated according to said contrast result, including said sensitivity as a parameter.

[Claim 4] Said image pick-up conditions are imaging devices according to claim 2 which include as a parameter the exposure value which is fluctuated according to said contrast result and given to said exposure control part.

[Claim 5] In said image pick-up condition setting part, the 1st contents of sensitivity regulated treatment for said luminous body, Have embraced said distance among the 2nd contents of sensitivity regulated treatment for the luminous source in the environment where said photographic subject is placed, it is inputted by a gap or one side, and [ said sensitivity controller ] The imaging device according to claim 2 which performs amendment to color temperature by adjusting said sensitivity according to said one side chosen among said 1st

[ the ] and said 2nd contents of sensitivity regulated treatment.
[Claim 6] Have further the visibility controller which performs visibility regulated treatment which adjusts visibility about said picture information, and [ said image pick-up condition setting part ] It is the imaging device according to claim 3 with which it is contained in said image pick-up conditions as a parameter, the grade of said visibility regulated treatment of having embraced said distance is set up, and said visibility controller performs said visibility regulated treatment according to said extent.
[Claim 7] Said luminous body is an imaging device according to claim 2 which performs luminescence which it is contained in said image pick-up conditions as a parameter, and the light quantity which has embraced said distance is set to said image pick-up condition setting part, and balances said light quantity.

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an imaging device. This invention relates to the imaging device from which image pick-up conditions change according to the distance from a photographic subject especially.
[0002]
[Description of the Prior Art] In order to compensate a digital camera with lack of the quantity of light at the time of an image pick-up, generally it has the stroboscope. After obtaining sufficient brightness by luminescence of a stroboscope, the image pick-up of a photographic subject is performed.
[0003] The light quantity of the stroboscope is adjusted so that the picture of just right lightness may be obtained, when having fitted in the fixed range with the distance from a photographic subject to a digital camera. However, there was a case where the quantity of light becomes superfluous when the photographic subject is put on the near position side (macro position), and a picture flew.
[0004] On the other hand, when a photographic subject was located in the distance, and a strobe light did not fully arrive, there was a case where the quantity of light ran short and a picture was crushed. Moreover, it was set up so that white balance adjustment for strobe lights might be performed, when using a stroboscope generally in the digital camera which has the function to adjust white balance. However, in such a setup, at a long range, rule of the strobe light became weak, and the white balance of a picture has shifted.
[0005] As mentioned above, even if it used the stroboscope, there was a trouble that a suitable picture was not obtained depending on the position of a photographic subject. The technology

for solving this trouble is indicated by JP,H8-271955,A. This technology was made about the camera which uses a silver halide film, and has prevented the jump of a picture by restricting the light quantity of a stroboscope to the photographic subject of a macro position.

[0006]

[Problem to be solved by the invention] However, it is clear this technology's not to aim at dissolution of a trouble when the position of a photographic subject is far. Moreover, though the quantity of light is restricted in the case of a macro position, luminescence is performed for a short time and delicate adjustment is difficult. Therefore, there was a case where it did not restrict that the restricted quantity of light is suitable, but a picture flew.

[0007] Then, this invention aims at offering the imaging device which can solve the above-mentioned trouble. This purpose is attained by the combination of the feature given in the independent term in Claims. Moreover, a subordinate term specifies the further advantageous example of this invention.

[0008]

[Means for solving problem] Namely, the distance sensor by which the 1st form of this invention grasps the distance to a photographic subject, The luminous body which reinforces the catoptric light from said photographic subject by luminescence, and the image receiving body which accumulates said catoptric light as picture information, The exposure control part which controls the exposure to said image receiving body, and the sensitivity controller which adjusts the sensitivity to said catoptric light, It is an imaging device equipped with the control part which controls said exposure control part and said sensitivity controller, and said control part has embraced said distance and controls based on the image pick-up conditions about the lightness of said picture information.

[0009] The 2nd form of this invention has the distance judging part which outputs the contrast result obtained when said control part contrasts said distance with a distance criterion, and the image pick-up condition setting part to which said image pick-up conditions according to said contrast result are set.

[0010] As for said image pick-up conditions, said sensitivity is fluctuated for the 3rd form of this invention according to said contrast result, including said sensitivity as a parameter.

[0011] The 4th form of this invention includes as a parameter the exposure value which said image pick-up conditions are fluctuated according to said contrast result, and is given to said exposure control part.

[0012] The 5th form of this invention [ said image pick-up condition setting part ] Have embraced said distance among the 1st contents of sensitivity regulated treatment for said luminous body, and the 2nd contents of sensitivity regulated treatment for the luminous source in the environment where said photographic subject is placed, and a gap or one side is inputted. Said sensitivity controller performs amendment to color temperature by adjusting said

sensitivity according to said one side chosen among said 1st [ the ] and said 2nd contents of sensitivity regulated treatment.

[0013] The 6th form of this invention is further equipped with the visibility controller which performs visibility regulated treatment which adjusts visibility about said picture information, and [ said image pick-up condition setting part ] It is contained in said image pick-up conditions as a parameter, the grade of said visibility regulated treatment of having embraced said distance is set up, and said visibility controller performs said visibility regulated treatment according to said extent.

[0014] The light quantity to which the 7th form of this invention was included in said image pick-up conditions as a parameter at said image pick-up condition setting part, and has embraced said distance is set up, and said luminous body performs luminescence corresponding to said light quantity.

[0015] In addition, the outline of the above-mentioned invention is not what enumerated all the required features of this invention, and the subcombination of these characterizing groups can also be invented.

[0016]

[Mode for carrying out the invention] Although this invention is hereafter explained through the form of implementation of invention, not all the combination of the feature of the form of the following operations that do not limit invention concerning a claim and are explained in the form of operation is necessarily indispensable for the settlement means of invention.

[0017] Drawing 1 is a block diagram which illustrates the composition of the digital camera 10 which has the function to change image pick-up conditions, such as sensitivity, according to distance. First of all as what is explained in full detail by drawing 2 about the characteristic composition which realizes this function, the general composition and the general function of a digital camera 10 are explained.

[0018] A digital camera 10 mainly contains the imaging unit 20, the image pick-up control unit 40, the processing module 60, the display module 100, and the operation module 110.

[0019] The imaging unit 20 contains the mechanism member and the electric member about an image pick-up and image formation. The imaging unit 20 contains the imaging lens 22 which processes by taking in an image first, drawing 24, a shutter 26, optical LPF(low pass filter)28, CCD30, and the imaging signal processing part 32. The imaging lens 22 consists of a focus lens, a zoom lens, etc. By this composition, an object image carries out image formation on the acceptance surface of CCD30. According to the quantity of light of the object image which carried out image formation, an electric charge is accumulated in each sensor element (not shown) of CCD30 (the electric charge is called "stored charge" below). Stored charge is read to a shift register (not shown) by the lead gate pulse, and is read one by one by the register transfer pulse as a voltage signal.

[0020] Since a digital camera 10 generally has an electronic shutter function, its mechanical shutter like a shutter 26 is not indispensable. In order to realize an electronic shutter function, a shutter drain is formed in CCD30 through a shutter gate. Stored charge will be swept out by the shutter drain if a shutter gate is driven. The time for accumulating an electric charge in each sensor element, i.e., shutter speed, is controllable by control of a shutter gate.
[0021] The color of the voltage signal outputted from CCD30, i.e., an analog signal, is separated into R, G, and B component in the imaging signal processing part 32, and white balance is adjusted first. Continuing, the imaging signal processing part 32 performs gamma control, carries out the A/D conversion of R, G, and the B signal one by one to required timing, and outputs the digital image data (it is only called "digital image data" below) obtained as a result to the processing module 60.
[0022] The imaging unit 20 has a finder 34 and a stroboscope 36 further. The inner package of LCD which is not illustrated may be carried out to a finder 34, and the variety of information from the below-mentioned main CPU62 grade can be displayed in a finder 34 in that case. When the energy stored in the capacitor (not shown) is supplied to a discharge tube 36a, a stroboscope 36 functions because it emits light.
[0023] The image pick-up control unit 40 has imaging system CPU50 which control the zoom actuator 42, the focal actuator 44, the drawing actuator 46, the shutter actuator 48, and them, the ranging sensor 52, and the photometry sensor 54. Actuators, such as the zoom actuator 42, have the driving means of a stepping motor etc., respectively. According to the bottom of ** of the below-mentioned release switch 114, the ranging sensor 52 measures the distance to a photographic subject, and the photometry sensor 54 measures photographic subject brightness. The data (only henceforth "distance measurement data") of distance and the data (only henceforth "photometry data") of photographic subject brightness which were measured are sent to imaging system CPU50. Based on image pick-up information, including the zoom magnifying power directed by the user, imaging system CPU50 control the zoom actuator 42 and the focal actuator 44, and perform adjustment of the zoom magnifying power of the imaging lens 22, and a focus.
[0024] Imaging system CPU50 are extracted based on the digital signal integrated value, i.e., AE information, of RGB on 1 image frame, and determine a value and shutter speed. According to the determined value, the drawing actuator 46 and the shutter actuator 48 perform adjustment of the amount of drawing, and opening and closing of a shutter 26, respectively.
[0025] Imaging system CPU50 control luminescence of a stroboscope 36 based on photometry data, extract it simultaneously again, and adjust the amount of drawing of 24. When a user points to taking in of an image, CCD30 start a charge storage and stored charge is outputted to the imaging signal processing part 32 after progress of the shutter time calculated from

photometry data.

[0026] The processing module 60 has main CPU62 which control the digital camera 10 whole, especially processing module 60 self, the memory control part 64 controlled by this, YC processing part 70, the optional equipment control part 74, the compression extension processing part 78, and the communication I/F part 80. Main CPU62 exchange required information among imaging system CPU50 by serial communication etc. The operation clock of main CPU62 is given from the clock generation machine 88. The clock generation machine 88 offers the clock of frequency which is different also to imaging system CPU50 and the display module 100, respectively.

[0027] The character formation part 84 and the timer 86 are put side by side in main CPU62. The timer 86 was backed up by the battery and has always counted time. The information about image pick-up time and other time entries are given to main CPU62 from this count value. The character formation part 84 generates alphabetic information, such as image pick-up time and a title, and this alphabetic information is suitably compounded by the image pick.

[0028] The memory control part 64 controls the nonvolatile memory 66 and a main memory 68. The nonvolatile memory 66 consists of EEPROM (electric elimination and programmable ROM), a FLASH memory, etc., and the data which should hold during OFF of the power supply of a digital camera 10, such as setting information by a user and an adjustment value at the time of shipment, is stored. A boot program, a system program, etc. of main CPU62 may be stored in the nonvolatile memory 66 by a case.

[0029] On the other hand, a main memory 68 consists of memories whose capacity it is generally comparatively inexpensive like DRAM, and is big. A main memory 68 has the function as a frame memory to store the data outputted from the imaging unit 20, a function as a system memory which loads various programs, and the other functions as a work area. The nonvolatile memory 66 and a main memory 68 exchange data through each part and the main bus 82 of processing module 60 inside and outside.

[0030] YC processing part 70 performs YC conversion to digital image data, and generates the luminance signal Y, color difference (chroma) signal B-Y, and R-Y. A luminance signal and a color-difference signal are once stored in a main memory 68 by the memory control part 64. The compression extension processing part 78 reads and compresses a luminance signal and a color-difference signal one by one from a main memory 68. In this way, the compressed data (only henceforth "compressed data") is written in the memory card which is a kind of optional equipment 76 through the optional equipment control part 74.

[0031] The processing module 60 has an encoder 72 further. An encoder 72 inputs a luminance signal and a color-difference signal, changes these into a video signal (NTSC and PAL signal), and outputs them from the video output terminal 90. When generating a video signal from the data recorded on optional equipment 76, the data is first given through the

optional equipment control part 74 to the compression extension processing part 78. It continues and the data with which required extension processing was performed in the compression extension processing part 78 is changed into a video signal by the encoder 72.
[0032] The optional equipment control part 74 performs formation of a required signal, logic conversion, or voltage conversion between the main bus 82 and optional equipment 76 according to the signal specification and the Bath specification of the main bus 82 which are accepted in optional equipment 76. A digital camera 10 may support an I/O card with PCMCIA conformity standard, for example other than the above-mentioned memory card as optional equipment 76. In that case, the optional equipment control part 74 may consist of bus control LSI for PCMCIA etc.
[0033] The communication I/F part 80 controls the protocol conversion according to the specification of the communication specification which a digital camera 10 supports, for example, USB, RS-232C, Ethernet, etc. The communication I/F part 80 communicates through the external apparatus and the connector 92 which include a network including a driver IC if needed. It is good also as composition which performs data transfer by original I/F, for example among external apparatus, such as a printer, a karaoke machine, and a game machine, besides such standard specification.
[0034] The display module 100 has LCD monitor 102 and the LCD panel 104. They are controlled by the monitor driver 106 and the panel driver 108 which are an LCD driver, respectively. LCD monitor 102 is formed in the camera back, for example in the size of about 2 inches, and displays the screen for the present image pick-up, a reproductive mode, the zoom magnifying power of an image pick-up or reproduction, battery residue, time, and mode setting, an object image, etc. The LCD panel 104 is formed in the camera upper surface by black and white LCD small, for example, and displays in simple information, including quality of image (FINE/NORMAL/BASIC etc.), the prohibition on a strobe light/luminescence, the number of sheets that can be standard picturized, a pixel number, battery capacity, etc.
[0035] The operation module 110 contains a mechanism required in order that a user may set up or direct operation of a digital camera 10, its mode, etc., and an electric member. A power switch 112 opts for on--off of the power supply of a digital camera 10. The release switch 114 has two-step pushing structure of half press and full press. As an example, AF and AE lock by half press, taking in of an image pick is performed by full press, and it is recorded on a main memory 68 and optional equipment 76 grade after required signal conditioning, data compression, etc.
[0036] The operation module 110 may receive a setup by others, a revolving mode dial, a cross key, etc., and they are named the function-settings part 116 generically in drawing 1 .
[ switches / these ] As an example of operation which can be specified in the operation module 110, or a function, there are a "file format", "special effects", "*****",

"determination/preservation", "a display change", etc. A zoom switch 118 determines zoom magnifying power.

[0037] The main operation by the above composition is as follows.

[0038] The power switch 112 of a digital camera 10 is turned on first, and electric power is supplied to each part of a camera. Main CPU62 are reading the state of the function-settings part 116, and judge whether a digital camera 10 is in imaging mode, or it is in reproduction mode.

[0039] When a camera is in imaging mode, main CPU62 supervise the half-press state of a release switch 114. When a half-press state is detected, main CPU62 obtain photometry data and distance measurement data from the photometry sensor 54 and the ranging sensor 52, respectively. Based on the obtained data, the image pick-up control unit 40 operates, and adjustment of the focus of the imaging lens 22, drawing, etc. is performed. If adjustment is completed, characters, such as "standby", are displayed on LCD monitor 102, that is told to a user, and the full-press state of a release switch 114 will be supervised continuously.

[0040] If a release switch 114 is pressed fully, predetermined shutter time will be set, a shutter 26 will be closed, and the stored charge of CCD30 will be swept out to the imaging signal processing part 32. The digital image data generated as a result of processing by the imaging signal processing part 32 is outputted to the main bus 82. Digital image data is once stored in a main memory 68, receives processing in YC processing part 70 and the compression extension processing part 78 after this, and is recorded on optional equipment 76 via the optional equipment control part 74. The recorded picture is displayed on LCD monitor 102 for a while in the state where it was frozen, and the user can know an image pick. A series of imaging operation is completed above.

[0041] On the other hand, when a digital camera 10 is in reproduction mode, main CPU62 read the picture picturized at the last from the main memory 68 through the memory control part 64, and display this on LCD monitor 102 of the display module 100. If a user directs "passing <a thing> on" or "backward stitch" in the function-settings part 116 by this state, the picture picturized before and behind the picture displayed now will be read, and it will be displayed on LCD monitor 102.

[0042] Next, the composition and the function to determine image pick-up conditions according to distance are explained.

[0043] Drawing 2 is a block diagram which extracts the portion about the function to determine the image pick-up conditions about the lightness of a picture among composition of being illustrated by drawing 1 according to distance, and is illustrated in detail. Imaging system CPU50 have the image pick-up condition setting part 200, the image pick-up condition output command part 300, the nonvolatile memory 400, and the white balance adjustment condition output part 500. By this composition, CPU50 determine image pick-up conditions based on the

distance measurement data obtained from the ranging sensor 52. The contents are explained below.

[0044] The distance measurement data obtained from the ranging sensor 52 is outputted to the photographic subject distance rank judging part 310. The ranging sensor 52 may obtain distance measurement data by measuring the distance to a photographic subject directly, and may obtain it by counting distance backward from the setting state of the focus ring with which a digital camera 10 is equipped, for example. The rank judging part 310 carries out the rank division of the distance from a photographic subject based on distance measurement data.

[0045] Drawing 3 is a mimetic diagram which illustrates the situation of a rank division. Distance is classified into the distance rank L which runs short of the distance ranks M which can perform a suitable image pick-up, the distance ranks S nearer than this (it corresponds when a photographic subject exists in a macro position), and strobe lights according to luminescence of a stroboscope 36.

[0046] This classification is made when the distance Lmin and Lmax used as the distance x from a digital camera 10 to a photographic subject 12 and a standard (Lmin<Lmax) is compared by the rank judging part 310 of drawing 2 . Distance Lmin is a distance which is [ of a strobe light ] superfluous with a boundary with a state in proper quantity here, and distance Lmax is a distance which serves as a boundary of a state and an insufficient state in proper quantity.

[0047] Furthermore, the image pick-up condition output command part 300 of drawing 2 makes the mode set up in the function-settings part 116 read by the mode reading part 330. A user makes the drawing value and shutter soeed which were set up by manual operation read in the exposure control part 58, and calculation of an exposure value and the judgment of the rank are made to perform by the exposure value rank judging part 320 with this. What is necessary is just to perform the judgment of the rank of an exposure value like a rank division of the distance illustrated by drawing 3 .

[0048] Moreover, the luminescence necessity judging part 340 judges the necessity of luminescence of a stroboscope 36 based on the photometry data from the photometry sensor 54. The output command part 300 makes a distance rank, a mode, an exposure value rank, and the image pick-up conditions according to the necessity of luminescence output from the image pick-up condition table 410 memorized by the nonvolatile memory 400.

[0049] Drawing 4 is a mimetic diagram which illustrates the contents of the image pick-up condition table 410. The image pick-up condition table 410 is a table which gives correspondence with distance rank S-L and the exposure value rank at the time of manual operation, and image pick-up conditions. Exposure (a drawing value and shutter soeed), sensitivity (a gain and white balance (WB)), visibility (aperture processing level), and the conditions about luminescence (light quantity) are specified in detail.

[0050] The contents of these parameters change the contents of the parameter variously to the distance from a photographic subject, and are acquired by investigating beforehand the state where it seems that it is the optimal. Moreover, if attached to the thing except visibility among these parameters, the lightness of a picture is influenced directly. On the other hand, visibility is specified as one of the parameters, in order to oppose that a noise increases with the increase in the sensitivity which determines the brightness of a picture. That is, it can be said that visibility is an indirect parameter required in order to set the brightness of a picture as a request.

[0051] If it gives an outline, the image pick-up condition table 410 is created so that distance becomes large, and the exposure value, the gain, and light quantity at the time of auto operation may become large. About exposure, it extracts, so that distance becomes large, and 24 is opened wide, and the shutter soeed is set up to become late. The above composition amends the excess of the quantity of light from a stroboscope 36 or lack which becomes serious according to the far and near grade of distance, and it becomes possible to secure the lightness of a picture.

[0052] Moreover, it is set up so that an aperture processing level may become lower, as a gain is large. This has lowered the grade of edge enhancement processing (aperture processing) in order to reduce a noise in view of what the noise of a picture increases (a picture becomes rude) so that a gain becomes large.

[0053] Moreover, the exposure value at the time of manual operation supports having formed the mode which permits a setup of exposure by manual operation. By setting up two or more sorts of image pick-up conditions selectable also within the same distance rank, it becomes possible to read image pick-up conditions (especially gain) suitable for the exposure value set up by manual operation.

[0054] If attached to how image pick-up conditions are made to output from the image pick-up condition table 410 based on the result of a rank judging etc., it mentions later.

[0055] So that it may be illustrated by drawing 2 [ the image pick-up condition setting part 200 ] The exposure condition setting part 210 which has the drawing value setting part 212 and the shutter-soeed setting part 214, It has the luminescence condition setting part 220 which has the light quantity setting part 222, the sensitivity condition setting part 230 which has the gain setting part 232 and the white balance adjustment condition setting part 234, and the visibility condition setting part 240 which has the aperture processing level-setting part 242. The contents of the parameter of the image pick-up conditions read from the image pick-up condition table 410 are inputted into the component which corresponds, respectively.

[0056] In detail, a drawing value and a shutter soeed are inputted into the drawing value setting part 212 and the shutter-soeed setting part 214, respectively, and it has the function to hold these, respectively, in them. And these contents are given to the drawing actuator 46 and

the shutter actuator 48 with which the exposure control part 58 is equipped, respectively, and the control according to these contents is made to perform. however, such processing is performed -- a setup of exposure -- being automatic (auto) -- it is the case where it is carried out. When setting up exposure by manual operation is specified, the mode reading part 330 gives the command which forbids change of a setup to the exposure condition setting part 210 so that it may be illustrated by drawing 4 . The state of the exposure which the user set up is held by this.

[0057] It is given to the gain adjustment part 602 with which the sensitivity controller 600 is equipped, the gain setting part 232 holding the inputted gain, and determines the gain to the stored charge of CCD30. The gain adjustment part 602 amplifies stored charge based on the given gain.

[0058] The aperture processing level-setting part 242 holds the inputted aperture processing level, and outputs it to the visibility controller 620 with which the imaging signal processing part 32 is equipped. The visibility controller 630 has the aperture processing part 622, and the aperture processing part 622 performs processing which emphasizes an outline according to the given aperture processing level.

[0059] The light quantity setting part 222 holds any [ "R" (control), "N" (usually), or ] of "0" (emitting [ no ] light) ( drawing 4 ) the inputted light quantity is, and makes a stroboscope 36 control by the emission control part 36b. The light quantity setting part 222 sets the light quantity of a stroboscope 36 as "0" according to an input called light quantity "0", and, specifically, orders prohibition of luminescence to the emission control part 36b. Moreover, when light quantity is "R", light quantity lower than normal mode is set up, and the light quantity of a stroboscope 36 is decreased rather than normal mode by the emission control part 36b. Such control is made by shortening emission time further. When light quantity is "N", the light quantity of a passage is usually set up.

[0060] The specification about by any white balance shall be adjusted between stroboscope mode (ST) or normal mode (N) is inputted into the white balance adjustment condition setting part 234 ( drawing 4 ). Here, stroboscope mode and normal mode are modes in which the conventional digital camera was also used. In the conventional digital camera, when making a stroboscope 36 emit light, stroboscope mode was chosen compulsorily, and when not making light emit, normal mode was chosen.

[0061] On the other hand, in the digital camera 10 of the form of this operation, even when making a stroboscope 36 emit light so that it may be illustrated by drawing 4 , in the case of the distance rank L, it is set up so that normal mode may be chosen. By this, also in the case of the distance rank L, when the rule of the light from the luminous source under the environment where the photographic subject of the sun or a fluorescent light has set rather than the light from a stroboscope 36 is stronger, white balance suitable for the color

temperature of this environment light can be adjusted.

[0062] Of course, even when a stroboscope 36 is made to emit light preparatorily, the color temperature judging part 510 judges with a strobe light being the most dominant, and a distance rank is "L", adjustment of the white balance for strobe lights will be performed. Therefore, a strobe light can also be referred to as being one of the environmental luminous sources which the photographic subject has set.

[0063] The concrete method of setting up the adjustment condition according to the adjustment mode of white balance is explained. According to the input in "stroboscope mode", by the white balance adjustment condition read-out part 520, the adjustment condition setting part 234 makes the adjustment conditions for strobe lights read from the white balance (WB) adjustment condition table 440 memorized by the nonvolatile memory 400, and holds this.

[0064] On the other hand, when "normal mode" is inputted, it is judged by reading the setting state of the function-settings part 116 whether automatically, a luminous source should be judged and the adjustment conditions of white balance should be read, or the adjustment conditions for luminous sources which the user chose should be read.

[0065] In the case of the former, the adjustment condition setting part 234 operates the color temperature judging part 510, and makes the color temperature of a luminous source judge automatically in it based on the signal of RGB obtained from CCD30. Based on this judged result, the adjustment condition read-out part 520 reads adjustment conditions from the adjustment condition table 440, and outputs them to the adjustment condition setting part 234. In the case of the latter, the white balance manual setting mode reading part 530 is operated, and it makes it read in it the mode for which luminous sources to be set up by the user in the function-settings part 116. The adjustment condition read-out part 520 reads adjustment conditions suitable for the color temperature of this luminous source from the adjustment condition table 440 based on the result of this read-out, and outputs them to the adjustment condition setting part 234.

[0066] The adjustment condition setting part 234 holds the adjustment conditions inputted as mentioned above, and gives them to the white balance adjustment part 604 with which the sensitivity controller 600 is equipped. The white balance adjustment part 604 adjusts white balance based on the inputted adjustment conditions. Adjustment of white balance is adjusting the gain of each element RGB of color, and it can be said that it is fine adjustment of the sensitivity corresponding to color temperature.

[0067] The picture which has suitable lightness is obtained by performing an image pick-up based on the image pick-up conditions inputted as mentioned above. Below, the procedure in the case of picturizing using a digital camera 10 is explained.

[0068] Drawing 5 is a flow chart which illustrates the procedure in the case of picturizing using the digital camera 10 of the form of this operation. First, the processing for an image pick-up is

started in Step S10. Next, in Step S12, a digital camera 10 receives the input by the user for setting up a mode in the function-settings part 116 of drawing 2 . The user chooses sensitivity adjustment mode, when it wants image pick-up conditions to be automatically set up according to distance. Moreover, a setup of exposure conditions is made into the manual mode to perform only a setup of exposure conditions by manual operation also under sensitivity adjustment mode.

[0069] Next, ranging and photometry are performed by the ranging sensor 52 and the photometry sensor 54 of drawing 2 in Step S14. The photometry data obtained by this is used and it is judged [ luminescence by a stroboscope 36 ] for necessity in Step S16 whether it is no. It shifts to Step S20 noting that quantity of light also with sufficient ** is obtained not using a stroboscope 36, when judged as "NO." On the other hand, when judged as "YES", it shifts to Step S30.

[0070] In Step S30, it is judged whether it is set as sensitivity adjustment mode by the mode reading part 330 of drawing 4 . When judged as "YES", it is necessary to adjust sensitivity so that it may correspond to the strobe light which serves as an excess and suitable and insufficient either according to the distance from a photographic subject, and shifts to Step S32. It shifts to Step S20 noting that it is not necessary to adjust sensitivity according to distance, when judged as "NO" on the other hand.

[0071] In Step S32, it judges based on a setup in Step S12 about by any a setup of exposure conditions shall be performed between manual operation or auto processing. When judged as "auto (A)", it shifts to Step S34, and when judged as "a manual (M)", it shifts to Step S36.

[0072] In Step S20, S34, and S36, read-out of image pick-up conditions is performed by the image pick-up condition output command part 300 of drawing 4 . At each step, it is determined [ as which the output of each component of the output command part 300 is adopted about read-out of image pick-up conditions / or or ] according to what kind of mode is chosen by the user whether to be ignored. The image pick-up conditions read change with the combination of employment and disregard. The system is explained to below.

[0073] In the case of Step S20, according to it having been read in the mode reading part 330 that it is not sensitivity adjustment mode (Step S30), the judged result of the photographic subject distance rank judging part 310 and the exposure value rank judging part 320 is disregarded. Then, the output command part 300 outputs the image pick-up conditions (exposure, sensitivity, visibility, and conditions of luminescence) of the read-out number 5 of drawing 4 to the image pick-up condition setting part 200 as default conditions which do not depend on distance.

[0074] Any shall be outputted between "0" or "N" as light quantity at this time answers the judged result of the luminescence necessity judging part 340. That is, when judged with luminescence being required, "N" is outputted, and "0" is outputted when judged with it being

unnecessary. When similarly adjustment of white balance (WB) is also judged with luminescence being unnecessary and it judges that normal mode (N) is required, stroboscope mode (ST) is outputted. Processing of the selection about adjustment of light quantity and white balance is common also about Step S34 and S38.

[0075] Performing a setup of the thing for which image pick-up conditions should be read based on the distance from a photographic subject, and exposure conditions by automatic processing at Step S34 on the other hand embraces having been read in the mode reading part 330. The judged result of the exposure value rank judging part 320 is disregarded, and the result of the photographic subject distance rank judging part 310 and the luminescence necessity judging part 340 is used. In this case, based on the judged result of the photographic subject distance rank judging part 310, in the case of the distance rank S, it reads, and in the image pick-up conditions of a number 2, in the case of the distance rank M, the image pick-up conditions of the read-out number 5 read in the case of the distance rank L, and the image pick-up conditions of a number 8 are outputted, respectively.

[0076] A setup by the user of exposure conditions is received in Step S36. The user should just input a favorite drawing value and a favorite shutter soeed into the exposure control part 58 of drawing 2 by manual operation. Thus, in the drawing value and shutter soeed as specification in the image pick-up condition table 410, receiving a setup of exposure of user liking takes that "blur" may arise into consideration, when the depth of focus for which a user asks is not obtained. Moreover, although detailed explanation is not given here, it is also possible to adopt the composition to which a user is made to set either a drawing value or the shutters soeed. In this case, based on the drawing precedence AE or the shutter-soeed precedence AE, another side which remains will be set up automatically.

[0077] In continuing Step S38, read-out of the image pick-up conditions based on the distance and the inputted exposure conditions from a photographic subject is performed. According to the exposure value rank, the gain is changed so that he can understand, if the image pick-up condition table 410 of drawing 4 is referred to. In order to lose "blur" with such composition, for example, also when a user sets up a shutter soeed short, it becomes possible to secure the lightness of a picture by enlarging a gain.

[0078] It embraces that it was read in Step S38 that it is sensitivity adjustment mode in the mode reading part 330, and a setup of exposure conditions is a manual mode. All the results of the photographic subject distance rank judging part 310, the exposure value rank judging part 320, and the luminescence necessity judging part 340 are considered, and read-out of image pick-up conditions is performed.

[0079] In this case, it reads based on a distance rank and an exposure value rank (manual), and a number is determined. For example, when it is the distance rank S and is exposure value rank EXR3, the image pick-up conditions of the read-out number 3 are read.

[0080] Here, according to exposure already being set up by the user, the thing (a drawing value and shutter soeed) about exposure must be disregarded among image pick-up conditions. Then, the mode reading part 330 outputs the signal which forbids change of a setup to the image pick-up condition setting part 200 (in detail exposure condition setting part 210).

[0081] In Step S40 which follows Step S20, S34, and S38, a user judges whether image pick-up conditions are suitable. This can be made by capturing an image into LCD monitor 102 of drawing 1 by preliminary image pick-up. A user observes the displayed picture and checks about lightness, the depth of focus, blur, etc. And what is necessary is just to picturize in Step S50 on the image pick-up condition, when it is judged that image pick-up conditions are suitable (YES). In Step S70, processing is ended after that.

[0082] On the other hand, when it is judged as (NO) with unsuitable image pick-up conditions, in Step S60, a user judges whether image pick-up processing is continued. For example, what is necessary is just to judge it as (NO) which ends processing, when it is judged that the lack of sunshine is unsuppliable with change of image pick-up conditions.

[0083] However, when a default value is adopted, for example as image pick-up conditions (Step S20) and a picture is not pleasing, the room which can obtain a favorite picture is left behind by choosing sensitivity adjustment mode. In such a case, it is judged that image pick-up processing is continued (YES). Reinput of mode setting is received in Step S62, and a user can be picturized under new image pick-up conditions by changing a setup of sensitivity adjustment mode, and a setup of exposure conditions.

[0084] It becomes possible to choose the image pick-up conditions which were suitable for distance from the photographic subject by composition of the form of this above operation. The picture which does not depend on the position of a photographic subject but has suitable lightness by this can be obtained. Especially when a photographic subject belongs to the distance rank S, specifically, it becomes possible by controlling a gain and light quantity to avoid "a jump" of a picture.

[0085] Moreover, especially when a photographic subject belongs to the distance rank L, it becomes possible to compensate lack of the quantity of light of a stroboscope 36 by making a gain increase, and can avoid "shut" of a picture. Moreover, the increase in the noise accompanying the increase in a gain also becomes possible [ preventing by suppressing aperture processing ]. Furthermore, it is possible by also in the case of the distance rank L, setting up so that adjustment of white balance may become normal mode to make adjustment suitable for the color temperature of the luminous source which illuminates a photographic subject perform.

[0086] Although composition of drawing 2 was explained above, only this composition cannot necessarily attain an above-mentioned effect. For example, it is also possible to equip the

processing module 60 of drawing 1 with the white balance adjustment part 604 and the aperture processing part 622 with which the imaging signal processing part 32 is equipped in drawing 2 . Furthermore, as illustrated in imaging system CPU50 at drawing 2 , it has the nonvolatile memory 400, but it is possible to also make the nonvolatile memory 66 of drawing 1 memorize the image pick-up condition table 410.

[0087] Moreover, in the example of drawing 2 , if the image pick-up condition output command part 300 is referred to, the photometry data from the photometry sensor 54 is used only in order to judge the necessity of luminescence, so that clearly (luminescence necessity judging part 340). However, it is also possible to adopt the composition from which the level of image pick-up conditions changes according to the level of photometry data. This becomes possible [ realizing by subdividing each distance rank further by the rank of photometry data like the exposure value at the time of manual operation of the image pick-up condition table 410 of drawing 4 ]. In this case, you have to add the component which carries out the rank division of the photometry data according to that level to the image pick-up condition output command part 300.

[0088] Furthermore, although the distance rank and the exposure value rank are classified into three in drawing 4 , respectively, it is also possible to make a classification more, for example and to change image pick-up conditions finely. The distance rank M is the field which can originally picturize suitably by luminescence of a stroboscope 36 here, and the distance ranks S and L are fields which need the adjustment for performing a suitable image pick-up. Therefore, it is more efficient to subdivide the adjustment in the distance ranks S and L from the distance rank M.

[0089] As mentioned above, he can understand that there is considerable flexibility in the composition of the digital camera 10 for attaining the function to change image pick-up conditions according to distance.

[0090] As mentioned above, although this invention was explained using the form of operation, the technical range of this invention is not limited to the range given in the form of the above-mentioned implementation. Various change or improvement can be added to the form of the above-mentioned implementation. It is clear from a description of Claims that the form's which added such change or improvement it may be contained in the technical range of this invention.

[0091]

[Effect of the Invention] According to this invention, the suitable stroboscope drawing according to the distance to a photographic subject can be obtained so that clearly from the above-mentioned explanation.

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram which illustrates the composition of the digital camera 10 of the form of operation.

[Drawing 2] It is the block diagram which illustrates in detail the composition of the portion about the function which chooses the image pick-up conditions according to the distance to a photographic subject among the composition of drawing 1 .

[Drawing 3] It is the mimetic diagram which illustrates the judgment of a distance rank.

[Drawing 4] It is drawing which illustrates the composition of the image pick-up condition table 410.

[Drawing 5] It is the flow chart which illustrates the procedure of the image pick-up by a digital camera 10.

[Explanations of letters or numerals]

10 Digital Camera
20 Imaging Unit
24 Drawing
26 Shutter
30 CCD
32 Imaging Signal Processing Part
36 Stroboscope
46 Drawing Actuator
48 Shutter Actuator
50 Imaging System CPU
52 Ranging Sensor
58 Exposure Control Part
116 Function-Settings Part
200 Image Pick-up Condition Setting Part
310 Photographic Subject Distance Rank Judging Part
600 Sensitivity Controller
620 Visibility Controller

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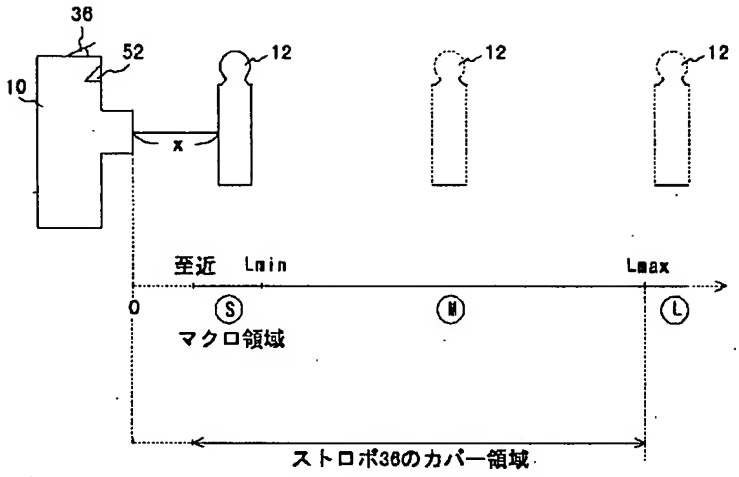
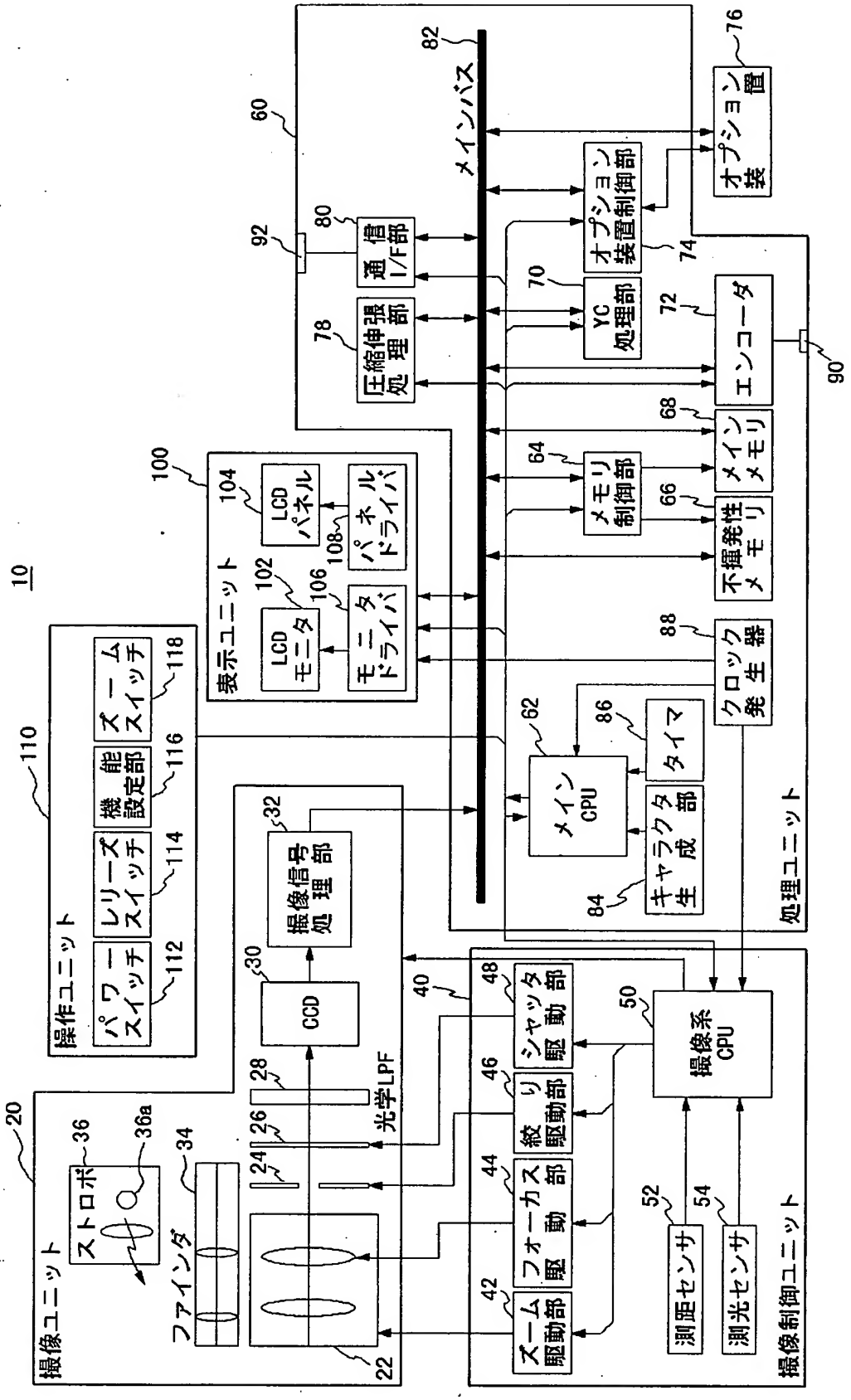
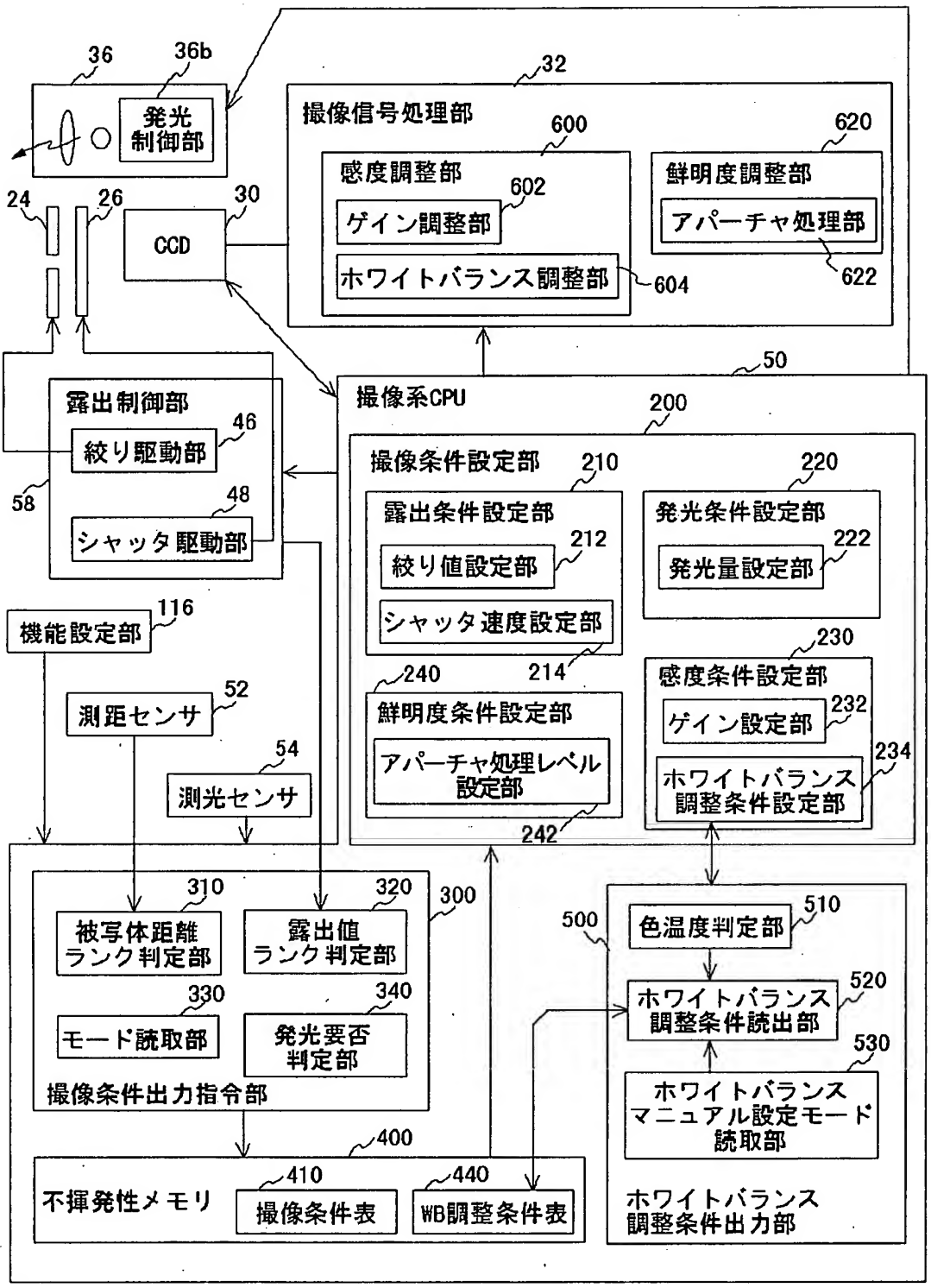
[Drawing 3]



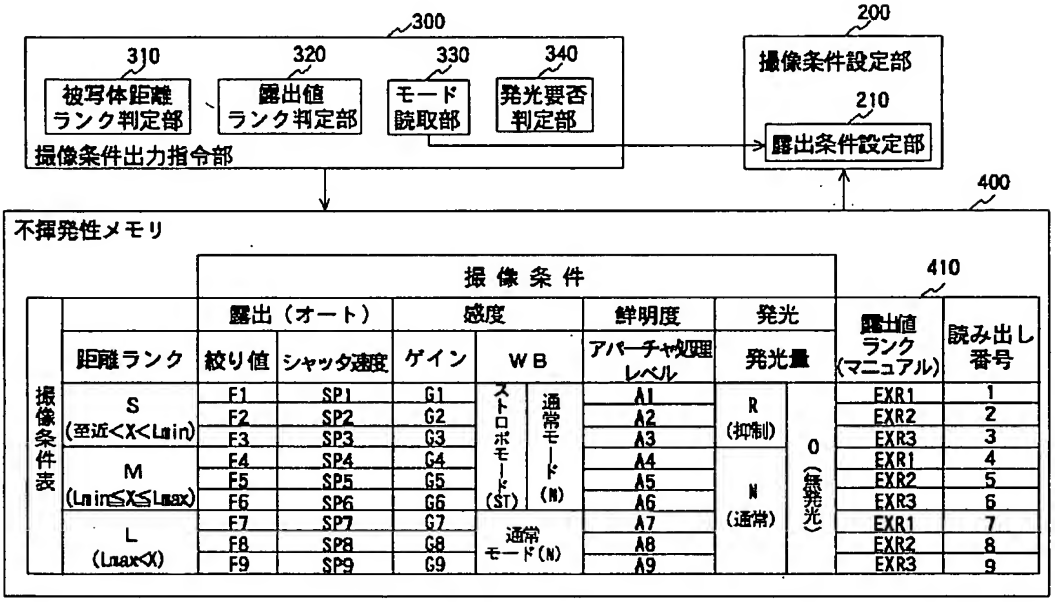

[Drawing 1]


10
撮像ユニット
ストロボ
ファインダ
光学LPF
CCD
撮像信号処理部
操作ユニット
パワースイッチ
レリーズスイッチ
機能設定部
ズームスイッチ
表示ユニット
LCDパネル
パネルドライバ
LCDモニタ
モニタドライバ
処理ユニット
メインCPU
タイマ
キャラクタ生成部
クロック発生器
メインバス
通信I/F部
圧縮伸張処理部
YC処理部
オプション装置制御部
エンコーダ
メインメモリ
メモリ制御部
不揮発性メモリ
オプション装置
撮像制御ユニット
撮像系CPU
シャッタ駆動部
絞り駆動部
フォーカス駆動部
ズーム駆動部
測距センサ
測光センサ

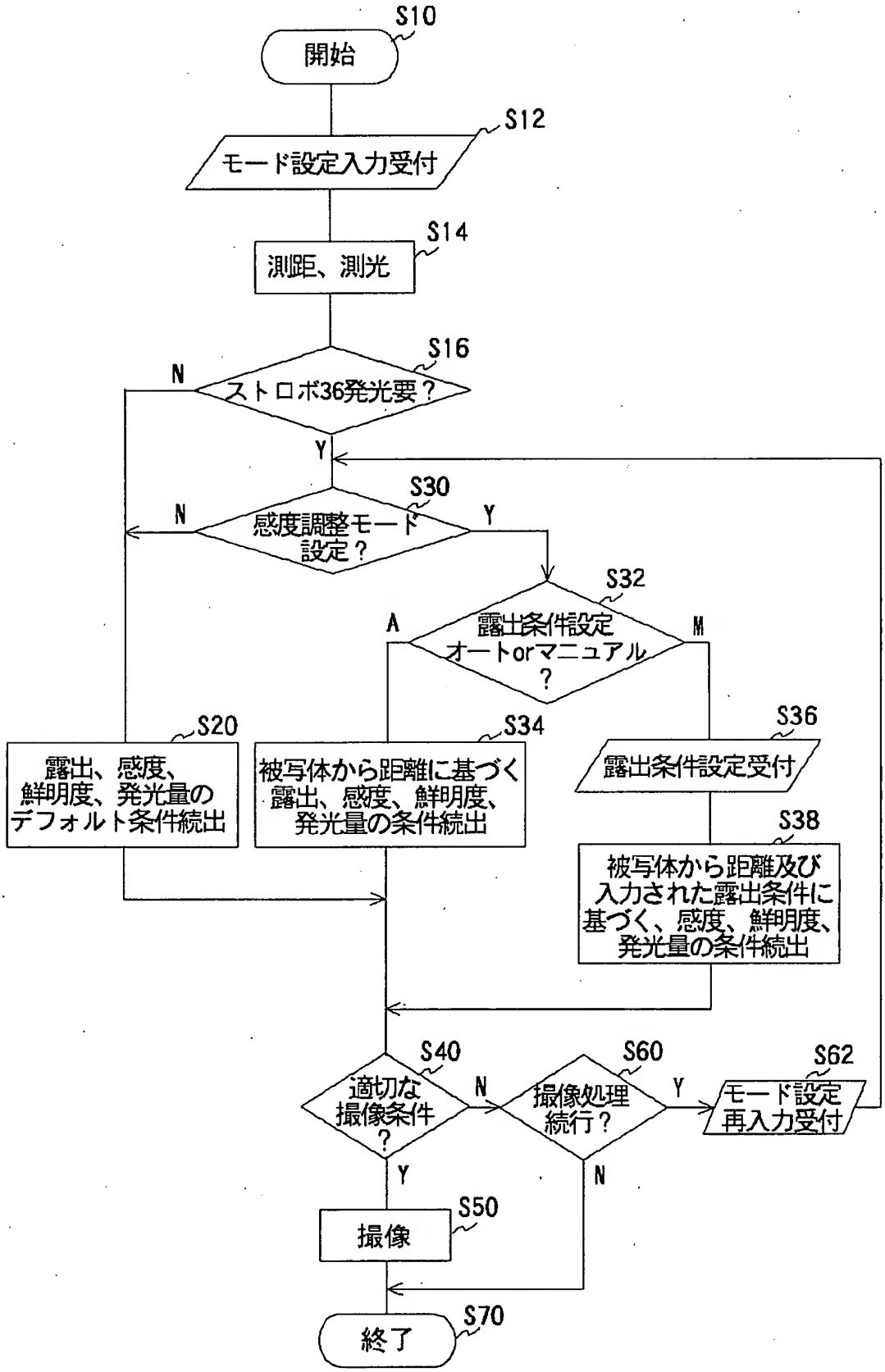
[Drawing 2]


36
36b
発光制御部
32
撮像信号処理部
600
感度調整部
602
ゲイン調整部
ホワイトバランス調整部
604
620
鮮明度調整部
アパーチャ処理部
622
24
26
30
CCD
50
撮像系CPU
200
露出制御部
46
絞り駆動部
58
48
シャッタ駆動部
撮像条件設定部
210
露出条件設定部
212
絞り値設定部
シャッタ速度設定部
214
220
発光条件設定部
222
発光量設定部
230
感度条件設定部
232
ゲイン設定部
234
ホワイトバランス調整条件設定部
240
鮮明度条件設定部
アパーチャ処理レベル設定部
242
116
機能設定部
52
測距センサ
54
測光センサ
310
被写体距離ランク判定部
320
露出値ランク判定部
300
330
モード読取部
340
発光要否判定部
撮像条件出力指令部
400
不揮発性メモリ
410
撮像条件表
440
WB調整条件表
500
色温度判定部
510
ホワイトバランス調整条件読出部
520
530
ホワイトバランスマニュアル設定モード読取部
ホワイトバランス調整条件出力部

[Drawing 4]


300
310
被写体距離ランク判定部
320
露出値ランク判定部
330
モード読取部
340
発光要否判定部
撮像条件出力指令部
200
撮像条件設定部
210
露出条件設定部
400
不揮発性メモリ
撮像条件表
撮像条件
410
露出（オート）
感度
鮮明度
発光
露出値ランク（マニュアル）
読み出し番号
距離ランク
絞り値
シャッタ速度
ゲイン
WB
アパーチャ処理レベル
発光量
S (至近<X<Lmin)
M (Lmin≦X≦Lmax)
L (Lmax<X)
F1 SP1 G1 A1 R (抑制) EXR1 1
F2 SP2 G2 A2 EXR2 2
F3 SP3 G3 A3 EXR3 3
F4 SP4 G4 A4 N (通常) EXR1 4
F5 SP5 G5 A5 EXR2 5
F6 SP6 G6 A6 EXR3 6
F7 SP7 G7 A7 EXR1 7
F8 SP8 G8 A8 EXR2 8
F9 SP9 G9 A9 EXR3 9
ストロボモード(ST)
通常モード(N)
通常モード(N)
0 (無発光)

[Drawing 5]


S10
開始
S12
モード設定入力受付
S14
測距、測光
S16
ストロボ36発光要？
N
Y
S30
感度調整モード設定？
N
Y
S32
露出条件設定オートorマニュアル？
A
M
S20
露出、感度、鮮明度、発光量のデフォルト条件続出
S34
被写体から距離に基づく露出、感度、鮮明度、発光量の条件続出
S36
露出条件設定受付
S38
被写体から距離及び入力された露出条件に基づく、感度、鮮明度、発光量の条件続出
S40
適切な撮像条件？
N
S60
撮像処理続行？
Y
S62
モード設定再入力受付
Y
N
S50
撮像
S70
終了

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[Translation done.]